

# SEQUENCE LISTING

<110> Sharma et al.

<120> SOLUBLE NOTCH-BASED SUBSTRATES FOR GAMMA SECRETASE AND METHODS AND COMPOSITIONS FOR USING SAME

<130> 28341/01130

<160> 17

<170> PatentIn version 3.1

<210> 1

<211> 2190

<212> DNA

<213> Artificial sequence

<220>

<223> DNA encoding synthetic fusion of notch and nus

<400> 1

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Ile Asp Arg Lys Ser Gly Asp Phe Asp Thr Phe Arg Arg Trp Leu Val  
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Val Asp Glu Val Thr Gln Pro Thr Lys Glu Ile Thr Leu Glu Ala Ala  
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Arg Tyr Glu Asp Glu Ser Leu Asn Leu Gly Asp Tyr Val Glu Asp Gln  
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Ile Glu Ser Val Thr Phe Asp Arg Ile Thr Thr Gln Thr Ala Lys Gln  
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Val Ile Val Gln Lys Val Arg Glu Ala Glu Arg Ala Met Val Val Asp  
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Gln Phe Arg Glu His Glu Gly Glu Ile Ile Thr Gly Val Val Lys Lys  
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Val Asn Arg Asp Asn Ile Ser Leu Asp Leu Gly Asn Asn Ala Glu Ala  
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Val Ile Leu Arg Glu Asp Met Leu Pro Arg Glu Asn Phe Arg Pro Gly  
165 170 175

Asp Arg Val Arg Gly Val Leu Tyr Ser Val Arg Pro Glu Ala Arg Gly  
180 185 190

Ala Gln Leu Phe Val Thr Arg Ser Lys Pro Glu Met Leu Ile Glu Leu  
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Phe Arg Ile Glu Val Pro Glu Ile Gly Glu Glu Val Ile Glu Ile Lys  
210 215 220

Ala Ala Ala Arg Asp Pro Gly Ser Arg Ala Lys Ile Ala Val Lys Thr

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Ala	Tyr	Val	Pro	Met	Lys	Glu	Leu	Leu	Glu	Ile	Glu	Gly	Leu	Asp	Glu
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Pro	Thr	Val	Glu	Ala	Leu	Arg	Glu	Arg	Ala	Lys	Asn	Ala	Leu	Ala	Thr
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Ile	Ala	Gln	Ala	Gln	Glu	Glu	Ser	Leu	Gly	Asp	Asn	Lys	Pro	Ala	Asp
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Asp	Leu	Leu	Asn	Leu	Glu	Gly	Val	Asp	Arg	Asp	Leu	Ala	Phe	Lys	Leu
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Leu	Ile	Met	Ala	Ala	Arg	Asn	Ile	Cys	Trp	Phe	Gly	Asp	Glu	Ala	Thr
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Ser	Gly	Ser	Gly	His	His	His	His	His	His	Ser	Ala	Gly	Lys	Glu	Thr
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Leu His Leu Met Tyr Val Ala Ala Ala Phe Val Leu Leu Phe Phe  
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Val Gly Cys Gly Val Leu Leu Ser Arg Lys Arg Arg Arg Gln His Gly  
595 600 605

Gln Leu Trp Phe Pro Glu Gly Phe Lys Val Ser Glu Ala Ser Lys Lys  
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Lys Arg Arg Glu Pro Leu Gly Glu Asp Ser Val Gly Leu Lys Pro Leu  
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Lys Asn Ala Ser Asp Gly Ala Leu Met Asp Asp Asn Gln Asn Glu Trp  
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Gly Asp Glu Asp Leu Glu Thr Lys Lys Phe Arg Phe Glu Glu Pro Val  
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Val Leu Pro Asp Leu Ser Asp Gln Thr Asp His Arg Gln Trp Thr Gln  
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Gln His Leu Asp Ala Ala Asp Leu Arg Met Ser Ala Met Ala Pro Thr  
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 Glu Ala Ser Lys Lys Lys Arg Arg Glu Pro Leu Gly Glu Asp Ser Val  
 65 70 75 80  
 Gly Leu Lys Pro Leu Lys Asn Ala Ser Asp Gly Ala Leu Met Asp Asp  
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 Asn Gln Asn Glu Trp Gly Asp Glu Asp Leu Glu Thr Lys Lys Phe Arg  
 100 105 110  
 Phe Glu Glu Pro Val Val Leu Pro Asp Leu Ser Asp Gln Thr Asp His  
 115 120 125  
 Arg Gln Trp Thr Gln Gln His Leu Asp Ala Ala Asp Leu Arg Met Ser  
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 Ser Thr Arg Cys Lys Asn Ala Gly Thr Cys Tyr Val Val Asp His Gly  
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 Leu Cys Leu Thr Pro Leu Asp Lys Pro Cys Leu Ala Asn Pro Cys Arg  
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 Asn Gly Gly Thr Cys Asp Leu Leu Thr Leu Thr Glu Tyr Lys Cys Arg  
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 Ser Tyr Ile Cys Arg Cys Pro Pro Gly Phe His Gly Pro Thr Cys Arg  
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 Gln Asp Val Asn Glu Cys Ser Gln Asn Pro Gly Leu Cys Arg His Gly  
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 Gly His Cys His Asn Glu Ile Gly Ser Tyr Arg Cys Ala Cys Cys Ala  
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 Thr His Thr Gly Pro His Cys Glu Leu Pro Tyr Val Pro Cys Ser Pro  
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 260 265 270  
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 275 280 285  
 Gly Gln Tyr Cys Thr Glu Asp Val Asp Glu Cys Gln Leu Met Pro Asn  
 290 295 300  
 Ala Cys Gln Asn Ala Gly Thr Cys His Asn Thr His Gly Gly Tyr Asn  
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 Arg Val Ala Ser Phe Tyr Cys Glu Cys Pro His Gly Arg Thr Gly Leu  
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 Asp Lys Ile Asp Gly Tyr Glu Cys Ala Cys Glu Pro Gly Tyr Thr Gly  
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Asp Glu Val Asp Glu Cys Ser Pro Asn Pro Cys Gln Asn Gly Ala  
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Thr Cys Thr Asp Tyr Leu Gly Gly Phe Ser Cys Lys Cys Val Ala  
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Arg Gly Thr Gln Asn Cys Val Gln Arg Val Asn Asp Phe His Cys  
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 Leu Gly Ser Leu Asn Ile Pro Tyr Lys Ile Glu Ala Val Lys Ser  
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Asn Ala	Ser Asp	Gly Ala	Leu	Met Asp	Asp Asn	Gln	Asn Glu	Trp	
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Gly Asp	Glu Asp	Leu Glu	Thr	Lys Lys	Phe Arg	Phe	Glu Glu	Pro	
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Leu Leu	Arg Asn	Arg Ala	Thr	Asp Leu	Asp Ala	Arg	Met His	Asp	
1970			1975			1980			
Gly Thr	Thr Pro	Leu Ile	Leu	Ala Ala	Arg Leu	Ala	Val Glu	Gly	
1985			1990			1995			
Met Leu	Glu Asp	Leu Ile	Asn	Ser His	Ala Asp	Val	Asn Ala	Val	
2000			2005			2010			
Asp Asp	Leu Gly	Lys Ser	Ala	Leu His	Trp Ala	Ala	Ala Val	Asn	
2015			2020			2025			

Asn Val 2030	Asp Ala Ala Val 2035	Val Leu Leu Lys Asn Gly 2040	Ala Asn Lys
Asp Ile 2045	Glu Asn Asn Lys Glu 2050	Glu Thr Ser Leu Phe 2055	Leu Ser Ile
Arg Arg 2060	Glu Ser Tyr Glu Thr 2065	Ala Lys Val Leu Leu 2070	Asp His Phe
Ala Asn 2075	Arg Asp Ile Thr Asp 2080	His Met Asp Arg Leu 2085	Pro Arg Asp
Ile Ala 2090	Gln Glu Arg Met His 2095	His Asp Ile Val Arg 2100	Leu Leu Asp
Glu Tyr 2105	Asn Leu Val Arg Ser 2110	Pro Gln Leu His Gly 2115	Thr Ala Leu
Gly Gly 2120	Thr Pro Thr Leu Ser 2125	Pro Thr Leu Cys Ser 2130	Pro Asn Gly
Tyr Pro 2135	Gly Asn Leu Lys Ser 2140	Ala Thr Gln Gly Lys 2145	Lys Ala Arg
Lys Pro 2150	Ser Thr Lys Gly Leu 2155	Ala Cys Gly Ser Lys 2160	Glu Ala Lys
Asp Leu 2165	Lys Ala Arg Arg Lys 2170	Ser Ser Gln Asp Gly 2175	Lys Gly Trp
Leu Leu 2180	Asp Ser Ser Ser Ser 2185	Met Leu Ser Pro Val 2190	Asp Ser Leu
Glu Ser 2195	Pro His Gly Tyr Leu 2200	Ser Asp Val Ala Ser 2205	His Pro Leu
Leu Pro 2210	Ser Pro Phe Gln Gln 2215	Ser Pro Ser Met Pro 2220	Leu Ser His
Leu Pro 2225	Gly Met Pro Asp Thr 2230	His Leu Gly Ile Ser 2235	His Leu Asn
Val Ala 2240	Ala Lys Pro Glu Met 2245	Ala Ala Leu Ala Gly 2250	Gly Ser Arg
Leu Ala 2255	Phe Glu His Pro Pro 2260	Pro Arg Leu Ser His 2265	Leu Pro Val
Ala Ser 2270	Ser Ala Cys Thr Val 2275	Leu Ser Thr Asn Gly 2280	Thr Gly Ala
Met Asn 2285	Phe Thr Val Gly Ala 2290	Pro Ala Ser Leu Asn 2295	Gly Gln Cys
Glu Trp 2300	Leu Pro Arg Leu Gln 2305	Asn Gly Met Val Pro 2310	Ser Gln Tyr
Asn Pro 2315	Leu Arg Pro Gly Val 2320	Thr Pro Gly Thr Leu 2325	Ser Thr Gln

Ala Ala Gly Leu Gln His Ser Met Met Gly Pro Leu His Ser Ser  
 2330 2335 2340  
 Leu Ser Thr Asn Thr Leu Ser Pro Ile Ile Tyr Gln Gly Leu Pro  
 2345 2350 2355  
 Asn Thr Arg Leu Ala Thr Gln Pro His Leu Val Gln Thr Gln Gln  
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 Val Gln Pro Gln Asn Leu Pro Leu Gln Pro Gln Asn Leu Gln Pro  
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 Pro Ser Gln Pro His Leu Ser Val Ser Ser Ala Ala Asn Gly His  
 2390 2395 2400  
 Leu Gly Arg Ser Phe Leu Ser Gly Glu Pro Ser Gln Ala Asp Val  
 2405 2410 2415  
 Gln Pro Leu Gly Pro Ser Ser Leu Pro Val His Thr Ile Leu Pro  
 2420 2425 2430  
 Gln Glu Ser Gln Ala Leu Pro Thr Ser Leu Pro Ser Ser Met Val  
 2435 2440 2445  
 Pro Pro Met Thr Thr Thr Gln Phe Leu Thr Pro Pro Ser Gln His  
 2450 2455 2460  
 Ser Tyr Ser Ser Ser Pro Val Asp Asn Thr Pro Ser His Gln Leu  
 2465 2470 2475  
 Gln Val Pro Glu Pro Thr Phe Leu Thr Pro Ser Pro Glu Ser Pro  
 2480 2485 2490  
 Asp Gln Trp Ser Ser Ser Ser Pro His Ser Asn Ile Ser Asp Trp  
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Asn	Gly	Gly	Lys	Cys	Glu	Ala	Ala	Asn	Gly	Thr	Glu	Ala	Cys	Val	Cys
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Gly	Gly	Ala	Phe	Val	Gly	Pro	Arg	Cys	Gln	Asp	Pro	Asn	Pro	Cys	Leu
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Ser	Thr	Pro	Cys	Lys	Asn	Ala	Gly	Thr	Cys	His	Val	Val	Asp	Arg	Arg
65					70					75					80
Gly	Val	Ala	Asp	Tyr	Ala	Cys	Ser	Cys	Ala	Leu	Gly	Phe	Ser	Gly	Pro
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Leu	Cys	Leu	Thr	Pro	Leu	Asp	Asn	Ala	Cys	Leu	Thr	Asn	Pro	Cys	Arg
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Asn	Gly	Gly	Thr	Cys	Asp	Leu	Leu	Thr	Leu	Thr	Glu	Tyr	Lys	Cys	Arg
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Cys	Pro	Pro	Gly	Trp	Ser	Gly	Lys	Ser	Cys	Gln	Gln	Ala	Asp	Pro	Cys
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Ala	Ser	Asn	Pro	Cys	Ala	Asn	Gly	Gly	Gln	Cys	Leu	Pro	Phe	Glu	Ala
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Ser	Tyr	Ile	Cys	His	Cys	Pro	Pro	Ser	Phe	His	Gly	Pro	Thr	Cys	Arg
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Gln	Asp	Val	Asn	Glu	Cys	Gly	Gln	Lys	Pro	Arg	Leu	Cys	Arg	His	Gly
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Gly	Thr	Cys	His	Asn	Glu	Val	Gly	Ser	Tyr	Arg	Cys	Val	Cys	Arg	Ala
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His	Glu	Cys	Ala	Cys	Leu	Pro	Gly	Phe	Thr	Gly	Gln	Asn	Cys	Glu	Glu
				245					250					255	
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Gly	Gln	Tyr	Cys	Thr	Glu	Asp	Val	Asp	Glu	Cys	Gln	Leu	Met	Pro	Asn
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Ala	Cys	Gln	Asn	Gly	Gly	Thr	Cys	His	Asn	Thr	His	Gly	Gly	Tyr	Asn
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Cys	Val	Cys	Val	Asn	Gly	Trp	Thr	Gly	Glu	Asp	Cys	Ser	Glu	Asn	Ile
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Asp Asp Cys Ala Ser Ala Ala Cys Phe His Gly Ala Thr Cys His Asp  
 340 345 350  
 Arg Val Ala Ser Phe Tyr Cys Glu Cys Pro His Gly Arg Thr Gly Leu  
 355 360 365  
 Leu Cys His Leu Asn Asp Ala Cys Ile Ser Asn Pro Cys Asn Glu Gly  
 370 375 380  
 Ser Asn Cys Asp Thr Asn Pro Val Asn Gly Lys Ala Ile Cys Thr Cys  
 385 390 395 400  
 Pro Ser Gly Tyr Thr Gly Pro Ala Cys Ser Gln Asp Val Asp Glu Cys  
 405 410 415  
 Ser Leu Gly Ala Asn Pro Cys Glu His Ala Gly Lys Cys Ile Asn Thr  
 420 425 430  
 Leu Gly Ser Phe Glu Cys Gln Cys Leu Gln Gly Tyr Thr Gly Pro Arg  
 435 440 445  
 Cys Glu Ile Asp Val Asn Glu Cys Val Ser Asn Pro Cys Gln Asn Asp  
 450 455 460  
 Ala Thr Cys Leu Asp Gln Ile Gly Glu Phe Gln Cys Met Cys Met Pro  
 465 470 475 480  
 Gly Tyr Glu Gly Val His Cys Glu Val Asn Thr Asp Glu Cys Ala Ser  
 485 490 495  
 Ser Pro Cys Leu His Asn Gly Arg Cys Leu Asp Lys Ile Asn Glu Phe  
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 Gln Cys Glu Cys Pro Thr Gly Phe Thr Gly His Leu Cys Gln Tyr Asp  
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 Val Asp Glu Cys Ala Ser Thr Pro Cys Lys Asn Gly Ala Lys Cys Leu  
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 Asp Gly Pro Asn Thr Tyr Thr Cys Val Cys Thr Glu Gly Tyr Thr Gly  
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 Thr His Cys Glu Val Asp Ile Asp Glu Cys Asp Pro Asp Pro Cys His  
 565 570 575  
 Tyr Gly Ser Cys Lys Asp Gly Val Ala Thr Phe Thr Cys Leu Cys Arg  
 580 585 590  
 Pro Gly Tyr Thr Gly His His Cys Glu Thr Asn Ile Asn Glu Cys Ser  
 595 600 605  
 Ser Gln Pro Cys Arg Leu Arg Gly Thr Cys Gln Asp Pro Asp Asn Ala  
 610 615 620  
 Tyr Leu Cys Phe Cys Leu Lys Gly Thr Thr Gly Pro Asn Cys Glu Ile  
 625 630 635 640  
 Asn Leu Asp Asp Cys Ala Ser Ser Pro Cys Asp Ser Gly Thr Cys Leu  
 645 650 655  
 Asp Lys Ile Asp Gly Tyr Glu Cys Ala Cys Glu Pro Gly Tyr Thr Gly

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Asn	Gly	Gly	Thr	Cys	Glu	Asp	Gly	Ile	Asn	Gly	Phe	Thr	Cys	Arg	Cys																														
	690					695					700																																		
Pro	Glu	Gly	Tyr	His	Asp	Pro	Thr	Cys	Leu	Ser	Glu	Val	Asn	Glu	Cys																														
705					710					715																																			
Asn	Ser	Asn	Pro	Cys	Val	His	Gly	Ala	Cys	Arg	Asp	Ser	Leu	Asn	Gly																														
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Tyr	Lys	Cys	Asp	Cys	Asp	Pro	Gly	Trp	Ser	Gly	Thr	Asn	Cys	Asp	Ile																														
			740					745						750																															
Asn	Asn	Asn	Glu	Cys	Glu	Ser	Asn	Pro	Cys	Val	Asn	Gly	Gly	Thr	Cys																														
		755					760					765																																	
Lys	Asp	Met	Thr	Ser	Gly	Ile	Val	Cys	Thr	Cys	Arg	Glu	Gly	Phe	Ser																														
	770					775					780																																		
Gly	Pro	Asn	Cys	Gln	Thr	Asn	Ile	Asn	Glu	Cys	Ala	Ser	Asn	Pro	Cys																														
785					790				795						800																														
Leu	Asn	Lys	Gly	Thr	Cys	Ile	Asp	Asp	Val	Ala	Gly	Tyr	Lys	Cys	Asn																														
				805					810					815																															
Cys	Leu	Leu	Pro	Tyr	Thr	Gly	Ala	Thr	Cys	Glu	Val	Val	Leu	Ala	Pro																														
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Cys	Ala	Pro	Ser	Pro	Cys	Arg	Asn	Gly	Gly	Glu	Cys	Arg	Gln	Ser	Glu																														
		835					840					845																																	
Asp	Tyr	Glu	Ser	Phe	Ser	Cys	Val	Cys	Pro	Thr	Ala	Gly	Ala	Lys	Gly																														
	850					855					860																																		
Gln	Thr	Cys	Glu	Val	Asp	Ile	Asn	Glu	Cys	Val	Leu	Ser	Pro	Cys	Arg																														
865					870					875					880																														
His	Gly	Ala	Ser	Cys	Gln	Asn	Thr	His	Gly	Xaa	Tyr	Arg	Cys	His	Cys																														
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Gln	Ala	Gly	Tyr	Ser	Gly	Arg	Asn	Cys	Glu	Thr	Asp	Ile	Asp	Asp	Cys																														
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Arg	Pro	Asn	Pro	Cys	His	Asn	Gly	Gly	Ser	Cys	Thr	Asp	Gly	Ile	Asn																														
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Thr	Ala	Phe	Cys	Asp	Cys	Leu	Pro	Gly	Phe	Arg	Gly	Thr	Phe	Cys	Glu																														
						935					940																																		
Glu	Asp	Ile	Asn	Glu	Cys	Ala	Ser	Asp	Pro	Cys	Arg	Asn	Gly	Ala	Asn																														
945					950					955					960																														
Cys	Thr	Asp	Cys	Val	Asp	Ser	Tyr	Thr	Cys	Thr	Cys	Pro	Ala	Gly	Phe																														
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Ser	Gly	Ile	His	Cys	Glu	Asn	Asn	Thr	Pro	Asp	Cys	Thr	Glu	Ser	Ser																														
				980				985					990																																



Cys Phe Asn Gly Gly Thr Cys Val Asp Gly Ile Asn Ser Phe Thr Cys  
 995 1000 1005  
  
 Leu Cys Pro Pro Gly Phe Thr Gly Ser Tyr Cys Gln His Val Val  
 1010 1015 1020  
  
 Asn Glu Cys Asp Ser Arg Pro Cys Leu Leu Gly Gly Thr Cys Gln  
 1025 1030 1035  
  
 Asp Gly Arg Gly Leu His Arg Cys Thr Cys Pro Gln Gly Tyr Thr  
 1040 1045 1050  
  
 Gly Pro Asn Cys Gln Asn Leu Val His Trp Cys Asp Ser Ser Pro  
 1055 1060 1065  
  
 Cys Lys Asn Gly Gly Lys Cys Trp Gln Thr His Thr Gln Tyr Arg  
 1070 1075 1080  
  
 Cys Glu Cys Pro Ser Gly Trp Thr Gly Leu Tyr Cys Asp Val Pro  
 1085 1090 1095  
  
 Ser Val Ser Cys Glu Val Ala Ala Gln Arg Gln Gly Val Asp Val  
 1100 1105 1110  
  
 Ala Arg Leu Cys Gln His Gly Gly Leu Cys Val Asp Ala Gly Asn  
 1115 1120 1125  
  
 Thr His His Cys Arg Cys Gln Ala Gly Tyr Thr Gly Ser Tyr Cys  
 1130 1135 1140  
  
 Glu Asp Leu Val Asp Glu Cys Ser Pro Ser Pro Cys Gln Asn Gly  
 1145 1150 1155  
  
 Ala Thr Cys Thr Asp Tyr Leu Gly Gly Tyr Ser Cys Lys Cys Val  
 1160 1165 1170  
  
 Ala Gly Tyr His Gly Val Asn Cys Ser Glu Glu Ile Asp Glu Cys  
 1175 1180 1185  
  
 Leu Ser His Pro Cys Gln Asn Gly Gly Thr Cys Leu Asp Leu Pro  
 1190 1195 1200  
  
 Asn Thr Tyr Lys Cys Ser Cys Pro Arg Gly Thr Gln Gly Val His  
 1205 1210 1215  
  
 Cys Glu Ile Asn Val Asp Asp Cys Asn Pro Pro Val Asp Pro Val  
 1220 1225 1230  
  
 Ser Arg Ser Pro Lys Cys Phe Asn Asn Gly Thr Cys Val Asp Gln  
 1235 1240 1245  
  
 Val Gly Gly Tyr Ser Cys Thr Cys Pro Pro Gly Phe Val Gly Glu  
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 Arg Cys Glu Gly Asp Val Asn Glu Cys Leu Ser Asn Pro Cys Asp  
 1265 1270 1275  
  
 Ala Arg Gly Thr Gln Asn Cys Val Gln Arg Val Asn Asp Phe His  
 1280 1285 1290  
  
 Cys Glu Cys Arg Ala Gly His Thr Gly Arg Arg Cys Glu Ser Val

1295	1300	1305
Ile Asn Gly Cys Lys Gly Lys 1310	Pro Cys Lys Asn Gly 1315	Gly Thr Cys 1320
Ala Val 1325	Ala Ser Asn Thr Ala 1330	Arg Gly Phe Ile Cys Lys Cys Pro 1335
Ala Gly 1340	Phe Glu Gly Ala Thr 1345	Cys Glu Asn Asp Ala Arg Thr Cys 1350
Gly Ser 1355	Leu Arg Cys Leu Asn 1360	Gly Gly Thr Cys Ile Ser Gly Pro 1365
Arg Ser 1370	Pro Thr Cys Leu Cys 1375	Leu Gly Pro Phe Thr Gly Pro Glu 1380
Cys Gln 1385	Phe Pro Ala Ser Ser 1390	Pro Cys Leu Gly Gly Asn Pro Cys 1395
Tyr Asn 1400	Gln Gly Thr Cys Glu 1405	Pro Thr Ser Glu Ser Pro Phe Tyr 1410
Arg Cys 1415	Leu Cys Pro Ala Lys 1420	Phe Asn Gly Leu Leu Cys His Ile 1425
Leu Asp 1430	Tyr Ser Phe Gly Gly 1435	Gly Ala Gly Arg Asp Ile Pro Pro 1440
Pro Leu 1445	Ile Glu Glu Ala Cys 1450	Glu Leu Pro Glu Cys Gln Glu Asp 1455
Ala Gly 1460	Asn Lys Val Cys Ser 1465	Leu Gln Cys Asn Asn His Ala Cys 1470
Gly Trp 1475	Asp Gly Gly Asp Cys 1480	Ser Leu Asn Phe Asn Asp Pro Trp 1485
Lys Asn 1490	Cys Thr Gln Ser Leu 1495	Gln Cys Trp Lys Tyr Phe Ser Asp 1500
Gly His 1505	Cys Asp Ser Gln Cys 1510	Asn Ser Ala Gly Cys Leu Phe Asp 1515
Gly Phe 1520	Asp Cys Gln Arg Ala 1525	Glu Gly Gln Cys Asn Pro Leu Tyr 1530
Asp Gln 1535	Tyr Cys Lys Asp His 1540	Phe Ser Asp Gly His Cys Asp Gln 1545
Gly Cys 1550	Asn Ser Ala Glu Cys 1555	Glu Trp Asp Gly Leu Asp Cys Ala 1560
Glu His 1565	Val Pro Glu Arg Leu 1570	Ala Ala Gly Thr Leu Val Val Val 1575
Val Leu 1580	Met Pro Pro Glu Gln 1585	Leu Arg Asn Ser Ser Phe His Phe 1590
Leu Arg 1595	Glu Leu Ser Arg Val 1600	Leu His Thr Asn Val Val Phe Lys 1605

Arg Asp Ala His Gly Gln Gln Met Ile Phe Pro Tyr Tyr Gly Arg  
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 Glu Glu Glu Leu Arg Lys His Pro Ile Lys Arg Ala Ala Glu Gly  
 1625 1630 1635  
 Trp Ala Ala Pro Asp Ala Leu Leu Gly Gln Val Lys Ala Ser Leu  
 1640 1645 1650  
 Leu Pro Gly Gly Ser Glu Gly Gly Arg Arg Arg Arg Glu Leu Asp  
 1655 1660 1665  
 Pro Met Asp Val Arg Gly Ser Ile Val Tyr Leu Glu Ile Asp Asn  
 1670 1675 1680  
 Arg Gln Cys Val Gln Ala Ser Ser Gln Cys Phe Gln Ser Ala Thr  
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 Asp Val Ala Ala Phe Leu Gly Ala Leu Ala Ser Leu Gly Ser Leu  
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 Pro Pro Pro Pro Ala Gln Leu His Phe Met Tyr Val Ala Ala Ala  
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 Ala Phe Val Leu Leu Phe Phe Val Gly Cys Gly Val Leu Leu Ser  
 1745 1750 1755  
 Arg Lys Arg Arg Xaa Gln His Gly Gln Leu Trp Phe Pro Glu Gly  
 1760 1765 1770  
 Phe Lys Val Ser Glu Ala Ser Lys Lys Lys Arg Arg Glu Xaa Leu  
 1775 1780 1785  
 Gly Glu Asp Ser Val Gly Leu Lys Pro Leu Lys Asn Ala Ser Asp  
 1790 1795 1800  
 Gly Ala Leu Met Asp Asp Asn Gln Asn Glu Trp Gly Asp Glu Asp  
 1805 1810 1815  
 Leu Glu Thr Lys Lys Phe Arg Phe Glu Glu Pro Val Val Leu Pro  
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 1835 1840 1845  
 Leu Asp Ala Ala Asp Leu Arg Met Ser Ala Met Ala Pro Thr Pro  
 1850 1855 1860  
 Pro Gln Gly Glu Val Asp Ala Asp Cys Met Asp Val Asn Val Arg  
 1865 1870 1875  
 Gly Pro Asp Gly Phe Thr Pro Leu Met Ile Ala Ser Cys Ser Gly  
 1880 1885 1890  
 Gly Gly Leu Glu Thr Gly Asn Ser Glu Glu Glu Glu Asp Ala Pro  
 1895 1900 1905  
 Ala Val Ile Ser Asp Phe Ile Tyr Gln Gly Ala Ser Leu His Asn

1910	1915	1920
Gln Thr Asp Arg Thr Gly 1925	Glu Thr Ala Leu His 1930	Leu Ala Ala Arg 1935
Tyr Ser Arg Ser Asp Ala 1940	Ala Lys Arg Leu Leu 1945	Glu Ala Ser Ala 1950
Asp Ala Asn Ile Gln Asp 1955	Asn Met Gly Arg Thr 1960	Pro Leu His Ala 1965
Ala Val Ser Ala Asp Ala 1970	Gln Gly Val Phe Gln 1975	Ile Leu Ile Arg 1980
Asn Arg Ala Thr Asp Leu 1985	Asp Ala Arg Met His 1990	Asp Gly Thr Thr 1995
Pro Leu Ile Leu Ala Ala 2000	Arg Leu Ala Val Glu 2005	Gly Met Leu Glu 2010
Asp Leu Ile Asn Ser His 2015	Ala Asp Val Asn Ala 2020	Val Asp Asp Leu 2025
Gly Lys Ser Ala Leu His 2030	Trp Ala Ala Ala Val 2035	Asn Asn Val Asp 2040
Ala Ala Val Val Leu Leu 2045	Lys Asn Gly Ala Asn 2050	Lys Asp Met Gln 2055
Asn Asn Arg Glu Glu Thr 2060	Pro Leu Phe Leu Ala 2065	Ala Arg Glu Gly 2070
Ser Tyr Glu Thr Ala Lys 2075	Val Leu Leu Asp His 2080	Phe Ala Asn Arg 2085
Asp Ile Thr Asp His Met 2090	Asp Arg Leu Pro Arg 2095	Asp Ile Ala Gln 2100
Glu Arg Met His His Asp 2105	Ile Val Arg Leu Leu 2110	Asp Glu Tyr Asn 2115
Leu Val Arg Ser Pro Gln 2120	Leu His Gly Ala Pro 2125	Leu Gly Gly Thr 2130
Pro Thr Leu Ser Pro Pro 2135	Leu Cys Ser Pro Asn 2140	Gly Tyr Leu Gly 2145
Ser Leu Lys Pro Gly Val 2150	Gln Gly Lys Lys Val 2155	Arg Lys Pro Ser 2160
Ser Lys Gly Leu Ala Cys 2165	Gly Ser Lys Glu Ala 2170	Lys Asp Leu Lys 2175
Ala Arg Arg Lys Lys Ser 2180	Gln Asp Gly Lys Gly 2185	Cys Leu Leu Asp 2190
Ser Ser Gly Met Leu Ser 2195	Pro Val Asp Ser Leu 2200	Glu Ser Pro His 2205
Gly Tyr Leu Ser Asp Val 2210	Ala Ser Pro Pro Leu 2215	Leu Pro Ser Pro 2220

Phe Gln Gln Ser Pro Ser Val Pro Leu Asn His Leu Pro Gly Met  
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 Pro Asp Thr His Leu Gly Ile Gly His Leu Asn Val Ala Ala Lys  
 2240 2245 2250  
 Pro Glu Met Ala Ala Leu Gly Gly Gly Gly Arg Leu Ala Phe Glu  
 2255 2260 2265  
 Thr Gly Pro Pro Arg Leu Ser His Leu Pro Val Ala Ser Gly Thr  
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 Gln Asn Leu Gln Met Gln Gln Gln Asn Leu Gln Pro Ala Asn Ile  
 2390 2395 2400  
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Ala Thr Val Ile Val Ile Thr Leu Val Met Leu Lys Lys Lys
20          25          30

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Ile Pro Glu Trp Leu Ile Ile Leu Ala Ser Leu Leu Leu Ala Leu Ala
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Leu Ile Leu Ala Val Cys Ile Ala Val Asn Ser Arg Arg Arg
20          25          30

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Leu Phe Phe Val Gly Cys Gly Val Leu Leu Ser Arg Lys Arg
20          25          30

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Asn Ile Pro Tyr Lys Ile Glu Ala Val Lys Ser Glu Pro Val Glu Pro
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Pro Leu Pro Ser Gln Leu His Leu Met Tyr Val Ala Ala Ala Ala Phe
20          25          30

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Val Leu Leu Phe Phe Val Gly Cys Gly Val Leu Leu Ser Arg Lys Arg  
35 40 45

Arg Arg Gln His Gly Gln Leu Trp Phe Pro Glu Gly Phe Lys Val Ser  
50 55 60

Glu Ala Ser Lys Lys Lys Arg Arg Glu Pro Leu Gly Glu Asp Ser Val  
65 70 75 80

Gly Leu Lys Pro Leu Lys Asn Ala Ser Asp Gly Ala Leu Met Asp Asp  
85 90 95

Asn Gln Asn Glu Trp Gly Asp Glu Asp Leu Glu Thr Lys Lys Phe Arg  
100 105 110

Phe Glu Glu Pro Val Val Leu Pro Asp Leu Ser Asp Gln Thr Asp His  
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Arg Gln Trp Thr Gln Gln His Leu Asp Ala Ala Asp Leu Arg Met Ser  
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Ala Met Ala Pro Thr Pro Pro Gln Gly Glu Val Asp Ala Asp  
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<213> Artificial sequence  
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<223> Nucleic acid encoding NusA  
<400> 16  
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caagagatcg acgtccgcgt acagatcgat cgcaaaagcg gtgattttga cactttccgt 180  
cgctgggttag ttgttgatga agtcacccag ccgaccaagg aaatcacctt tgaagccgca 240  
cgttatgaag atgaaagcct gaacctgggc gattacgttg aagatcagat tgagtctgtt 300  
acctttgacc gtatcactac ccagacggca aaacagggtta tcgtgcagaa agtgcgtgaa 360

```

gccgaacgtg cgatggtggt tgatcagttc cgtgaacacg aaggtgaaat catcaccggc 420
gtggtgaaaa aagtaaacgg cgacaacatc tctctggatc tgggcaacaa cgctgaagcc 480
gtgatcctgc gcgaagatat gctgccgctg gaaaacttcc gccctggcga ccgcgttcgt 540
ggcgtgctct attccgttcg cccggaagcg cgtggcgcgc aactgttcgt cactcgttcc 600
aagccggaag tgctgatcga actgttccgt attgaagtgc cagaaatcgg cgaagaagtg 660
attgaaatta aagcagcggc tcgcatcccg gggttctcgtg cgaaaatcgc ggtgaaaacc 720
aacgataaac gtatcgatcc ggtaggtgct tgcgtaggta tgcgtggcgc gcgtgttcag 780
gcggtgtcta ctgaactggg tggcgagcgt atcgatatcg tcctgtggga tgataacccg 840
gcgcagttcg tgattaacgc aatggcaccc gcagacgttg cttctatcgt ggtggatgaa 900
gataaacaca ccattggacat cgccgttgaa gccggtaatc tggcgaggcc gattggccgt 960
aacggtcaga acgtgcgtct ggcttcgcaa ctgagcgggt gggaactcaa cgtgatgacc 1020
gttgacgacc tgcaagctaa gcatcaggcg gaagcgacgc cagcgatcga caccttcacc 1080
aaatatctcg acatcgacga agacttcgcg actgttctgg tagaagaagg cttctcgacg 1140
ctggaagaat tggcctatgt gccgatgaaa gagctgttgg aaatcgaagg ccttgatgag 1200
ccgaccgttg aagcactgcg cgagcgtgct aaaaatgcac tggccaccat tgcacaggcc 1260
caggaagaaa gcctcgggtg taacaaaccg gctgacgac tgctgaacct tgaaggggta 1320
gatcgtgatt tggcatcaca actggccgcc cgtggcggtt gtacgctgga agatctcgcc 1380
gaacagggca ttgatgatct ggctgatatc gaagggttga ccgacgaaaa agccggagca 1440
ctgattatgg ctgccgtaa tatttctggt ttcggtgacg aagcgactag tggttctggt 1500
catcaccatc accatcactc cgccgggtaaa gaaaccgctg ctgcgaaatt tgaacgccag 1560
cacatggact cgccaccgcc aactggtctg gtcccccggg gcagcgcggg ttctggtacg 1620
attgatgacg acgacaagag tccgggagct cgtggatccg aattc 1665

```

```

<210> 17
<211> 555
<212> PRT
<213> Artificial sequence

<220>
<223> Protein sequence encoding NusA

<400> 17

```

```

Met Asn Lys Glu Ile Leu Ala Val Val Glu Ala Val Ser Asn Glu Lys
1             5             10             15

```

```

Ala Leu Pro Arg Glu Lys Ile Phe Glu Ala Leu Glu Ser Ala Leu Ala
20             25             30

```

```

Thr Ala Thr Lys Lys Lys Tyr Glu Gln Glu Ile Asp Val Arg Val Gln
35             40             45

```

```

Ile Asp Arg Lys Ser Gly Asp Phe Asp Thr Phe Arg Arg Trp Leu Val
50             55             60

```

```

Val Asp Glu Val Thr Gln Pro Thr Lys Glu Ile Thr Leu Glu Ala Ala
65             70             75             80

```

```

Arg Tyr Glu Asp Glu Ser Leu Asn Leu Gly Asp Tyr Val Glu Asp Gln
85             90             95

```

```

Ile Glu Ser Val Thr Phe Asp Arg Ile Thr Thr Gln Thr Ala Lys Gln
100            105            110

```



Val Ile Val Gln Lys Val Arg Glu Ala Glu Arg Ala Met Val Val Asp  
115 120 125  
Gln Phe Arg Glu His Glu Gly Glu Ile Ile Thr Gly Val Val Lys Lys  
130 135 140  
Val Asn Arg Asp Asn Ile Ser Leu Asp Leu Gly Asn Asn Ala Glu Ala  
145 150 155 160  
Val Ile Leu Arg Glu Asp Met Leu Pro Arg Glu Asn Phe Arg Pro Gly  
165 170 175  
Asp Arg Val Arg Gly Val Leu Tyr Ser Val Arg Pro Glu Ala Arg Gly  
180 185 190  
Ala Gln Leu Phe Val Thr Arg Ser Lys Pro Glu Met Leu Ile Glu Leu  
195 200 205  
Phe Arg Ile Glu Val Pro Glu Ile Gly Glu Glu Val Ile Glu Ile Lys  
210 215 220  
Ala Ala Ala Arg Asp Pro Gly Ser Arg Ala Lys Ile Ala Val Lys Thr  
225 230 235 240  
Asn Asp Lys Arg Ile Asp Pro Val Gly Ala Cys Val Gly Met Arg Gly  
245 250 255  
Ala Arg Val Gln Ala Val Ser Thr Glu Leu Gly Gly Glu Arg Ile Asp  
260 265 270  
Ile Val Leu Trp Asp Asp Asn Pro Ala Gln Phe Val Ile Asn Ala Met  
275 280 285  
Ala Pro Ala Asp Val Ala Ser Ile Val Val Asp Glu Asp Lys His Thr  
290 295 300  
Met Asp Ile Ala Val Glu Ala Gly Asn Leu Ala Gln Ala Ile Gly Arg  
305 310 315 320  
Asn Gly Gln Asn Val Arg Leu Ala Ser Gln Leu Ser Gly Trp Glu Leu  
325 330 335  
Asn Val Met Thr Val Asp Asp Leu Gln Ala Lys His Gln Ala Glu Ala  
340 345 350  
His Ala Ala Ile Asp Thr Phe Thr Lys Tyr Leu Asp Ile Asp Glu Asp  
355 360 365  
Phe Ala Thr Val Leu Val Glu Glu Gly Phe Ser Thr Leu Glu Glu Leu  
370 375 380  
Ala Tyr Val Pro Met Lys Glu Leu Leu Glu Ile Glu Gly Leu Asp Glu  
385 390 395 400  
Pro Thr Val Glu Ala Leu Arg Glu Arg Ala Lys Asn Ala Leu Ala Thr  
405 410 415  
Ile Ala Gln Ala Gln Glu Glu Ser Leu Gly Asp Asn Lys Pro Ala Asp  
420 425 430  
Asp Leu Leu Asn Leu Glu Gly Val Asp Arg Asp Leu Ala Phe Lys Leu

435	440	445
Ala Ala Arg Gly Val Cys Thr	Leu Glu Asp Leu Ala Glu Gln Gly Ile	
450	455	460
Asp Asp Leu Ala Asp Ile Glu Gly Leu Thr	Asp Glu Lys Ala Gly Ala	
465	470	475
Leu Ile Met Ala Ala Arg Asn Ile Cys Trp Phe Gly Asp Glu Ala Thr		
485	490	495
Ser Gly Ser Gly His His His His His His Ser Ala Gly Lys Glu Thr		
500	505	510
Ala Ala Ala Lys Phe Glu Arg Gln His Met Asp Ser Pro Pro Pro Thr		
515	520	525
Gly Leu Val Pro Arg Gly Ser Ala Gly Ser Gly Thr Ile Asp Asp Asp		
530	535	540
Asp Lys Ser Pro Gly Ala Arg Gly Ser Glu Phe		
545	550	555